Notes on some of the British Nepticulidae (Lep.)

By Lieut. Col. A. M. Emmet, M.B.E., T.D., M.A., F.R.E.S.

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BETULA spp. (Birch)

The British Nepticulid mines on birch are, except for two, easy to distinguish, and the following dichotomous table may be helpful to this end.

1. Mine forming a blotch 2
   Mine forming a gallery 3
2. Blotch roundish, frass, at least initially, forming a dark central blob ..... *argentipedella*
   Blotch rhomboidal or triangular, frass irregularly dispersed ..... *woolhopiella*
3. Gallery completely, or very nearly, filled with dispersed frass 4
   Gallery with a central line of frass, leaving well defined, clear margins 5
4. Mine at first light brown, often so contorted as to form a small blotch, then completely filled with greenish frass; mine inconspicuous, clouded ..... *continuella*
   Beginning of the mine blackish, the black frass throughout arranged in arcs, usually leaving a very narrow pale margin ..... *distinguenda*
5. Mine long, frass, at any rate latterly, forming a continuous, very thin central line with broad, clear margins 6
   Mine shorter, more contorted, with the frass-line broader and tending to be broken into blobs 7
6. First quarter of mine entirely filled with cloudy green frass ..... *lapponica*
   First quarter of mine, like the remainder, with a thin central line of black frass ..... *confusella*
7. Mine often much contorted at the start, frass-line tending to be narrower; larva with a paler head ..... *luteella*
   Mine less contorted at the start, frass-line tending to be thicker; larva with a darker head ..... *betulicola*

The table does not feature *Stigmella betulicola nanivora* Pet., the status of which was discussed in a recent paper (Brown 1970). Other common lepidopterous mines in birch leaves, which might be mistaken for Nepticulidae, are (a) *Lyonetia clerkella* L. which makes a very long narrow gallery with a central line of frass. If the larva is present, its size, length and incised segments serve to distinguish it; if it has gone, the length of the frass-free chamber which finally housed the larva is the point to look for, as also is the cylindrical white cocoon, slung hammock-wise under the leaf. (b) *Bucculatrix demaryella* Stt. which makes a very small, short mine in its first instar, generally following a rib. The final chamber is relatively long, narrow, and often angled.

Some notes on the eight birch species follow.

Dechtiria argentipedella Zell. is one of our commonest neps, with a single generation of larvae spread out from late August till the beginning of November; October is the best month for them. I find it a difficult species to rear, for I do not seem to be able to get the larvae to spin up. Others are more successful, so my failure must be due to mismanagement.

D. woolhopiella Stt., on the other hand, is one of the rarest species in this group, though it may be more common near the Herefordshire village from which it derives its name. I met with it for the first time in the autumn of 1970, when I found three mines in Kent, two near Westerham and one at Farningham. I understand from Mr J. M. Chalmers-Hunt that these consistute a new record for the county. Only one of my mines was tenanted, but the larva left its leaf before I reached home and suffered an accident; so that was that.

Nepticula continuella Stt. seems to be widely distributed in two generations, and is easy to rear.

N. distinguenda Hein. is a very local moth. Meyrick (1895 and 1928) and Tutt (1899, p. 283) give the distribution as Sussex and Hereford though the latter questioned the authenticity of the former's Sussex record. Waters does not mention it. I found vacated mines sparingly at Farningham and Westerham in north-west Kent in 1969, and again more plentifully in 1970. The species is said to be bivoltine and I looked assiduously for the second generation of larvae, which eluded me apart from a single tenanted mine whose occupant I carelessly allowed to spin up among the other birch-feeding species taken. I am unable to account for the apparent failure of the second generation. I found a single vacated mine at Quendon in Essex on the 2nd October 1970; I believe this and the examples from Kent to constitute new county records, though Mr Jacobs tells me that he anticipated me in finding the mines in Kent (in his case at Hayes, 2nd October 1943, Westerham, 12th October 1947 and Chislehurst Common, 14th October 1950, all these mines having been determined by A. G. Carolsfeld-Krausé) but he neglected to record them.

The mines of *N. lapponica* Wocke and *N. confusella* Wood were confused (as the latter's name may indicate) until Wood and then Waters pointed out the difference (see Hering, 1951, p. 88). [Who was the author of the name *confusella*? Meyrick (1928), Waters (1929), Ford (1949) and Heslop (1964) say Walsingham. Hering (1951 and 1957), Borkowski (1969) and the draft of the new edition of Kloet & Hincks's check-list say Wood; while Tutt (1899) says Walsingham and Wood. Wood (1894, p. 272) launched the species, but invited Lord Walsingham to describe it for him. Wood, therefore, is the author.] The difference between the mines of the two species is quite obvious when they are fresh, but becomes obscured as the leaves wither, especially if wet gets into the mines.

All authorities agree that *confusella* is univoltine, but there is local variation in the time of larval appearance. June to

early July seems to be the most favoured season, though I have found larvae still feeding in late August in the west of Ireland. On the other hand, there is disagreement over the number of larval generations of *lapponica*. Meyrick (1928) and Ford (1949) give two, and Tutt (1899) says it is partially bivoltine. Wood (1894, p. 96), Hering (1957) and Borkowski (1969) say there is only one brood and my own experience leads me to think that they are right. The larvae of *lapponica* come early in the year, before those of *confusella*, and I invariably miss them.

The mines of *Stigmella luteella* Stt. and *S. betulicola* Stt. are very hard to differentiate, and my key gives little help. The larvae themselves are just distinguishable, since that of *betulicola* is more yellow, and that of *luteella* is more green, but when the larva is seen in the mine the colour of the leaf tends to obscure this distinction. Both have the dorsal vessel bright green when they are feeding; Ford has done a disservice in mentioning this feature only in the case of *betulicola*. The relative colours of the head are not of much assistance unless larvae of each species are at hand for comparison. Hering (1957) says that *betulicola* mines venter upwards, while *luteella* does so venter downwards, but this, too, is hard to observe. Mines on seedlings, and leaves containing many mines, are usually *betulicola; luteella* seems to prefer the larger bushes and there are seldom more than two mines to a leaf. When the larvae spin up, *betulicola* makes reddish and *luteella* white cocoons. Both species are common and widely distributed in two generations, the second of which is more plentiful.

CRATAEGUS spp. (Hawthorn)

"Confusion now hath made his masterpiece!" I shall start with an apology to the reader. We have got ourselves into such a muddle over the hawthorn-feeding Nepticulidae, and the mistakes that have been made interact on each other to such an extent that the pages which follow will not make easy reading. My notes will fall into three parts. First I shall deal with the mistakes, treating them historically, and I shall attempt to put them right; secondly I shall give a dichotomous table to help in the determination of the mines and larvae of the species; and thirdly, I shall give random notes on their biology and distribution.

The easiest way to introduce the problem is by symbols rather than names. Five species are involved. Let us for the moment call them A, B, C. D and E.

Species A has been given two different descriptions for the female in our literature and it still is uncertain which is correct. Its mine is almost identical with that of B and the continental authors say that the only certain way of distinguishing A and B is by the examination of the genitalia.

Species B has been confused by some authors with A and by others with C. For a long time it was credited with C's

larva and there is still conflicting evidence regarding the colour of its true larva.

Species C is one of our commonest "neps" but it was not named until 1936 and it was not recognized as British until 1961, when a foreign author was responsible for adding it to our list. Its larva has often been mistaken for that of D and its vacated mine for that of D or E. For over sixty years it was equated with B, and many (perhaps most) specimens in collections labelled B are in fact C.

Species D is distinct as an imago, but its mine and larva have constantly been confused in literature and in practice with those of C. In one of our most famous entomological books, the figures of the larva and mine purporting to be those of D are in fact those of C.

Species E is also distinct as an imago and as a tenanted mine, but the vacated mine is often confused with those of C and D.

Needless to say, there is also a certain amount of trouble over nomenclature.

Now you are not intended to assimilate all the detail of what I have just written. My immediate purpose is to show that there are errors and ambiguities involving these species, all of them interacting on one another and so giving rise to a situation of no little complexity. Minor mistakes have added to the confusion. If we are to achieve any measure of clarity in unravelling this tangle, we must proceed by easy stages.

Let us start by naming in the same order the five species represented by letters above. They are *Nepticula ignobilella* Stt., *Stigmella hybnerella* Hübn. (*gratiosella* Dup.), *S. crataegella* Klim. (=*gratiosella* sensu auct. nec Dup.), *S. oxyacanthella* Stt. and *Nepticula pygmaeella* Haw.

When Stainton (1859) described *ignobilella*, he said that the head of the imago was red; Wood (1894) contradicted this, saying that it was red only in the male, but black in the female. In his description of "*gratiosella*" (to use the superseded name), Stainton said the larva was yellow; Wood denied this, too, and asserted it was green. I will let Wood tell his own eloquent story (1894, p. 47).

"Let me take first four species that feed on hawthorn (*Crataegus oxyacantha*). They divide themselves naturally into pairs, the one characterised by having bright green larvae and gallery mines with coiled frass, and the other by yellow or yellowish larvae and blotch mines.

"The gallery mines are *gratiosella* and *oxyacanthella*. With regard to the former, the ground wants a little clearing first. Some years ago, in the pages of this magazine, Mr Threlfall suggested that *gratiosella* and *ignobilella* were the sexes of one and the same species. Subsequently, my own experience in breeding *ignobilella* appeared to confirm his view. From yellow larvae collected in the autumn and carefully separated from the only other two yellow larvae, viz. *regiella* and *pygmaeella*, that could be found on the hawthorn (*gratiosella*, let it be

remembered, was said to have a yellow larva and to feed in the autumn), I bred a long series of the perfect insect, some with red heads and some with black; as the former were all males and the latter females, they could clearly be nothing more than the sexes of one species, and *gratiosella* as a species seemed doomed. It was not, then, till the question arose what the green *oxyacanthella*-like larvae, feeding in July and August, could be, and until moths were reared from them which answered accurately to the description of *gratiosella*, that its position was restored. The diagnosis in the "Manual" is perfect, so far as the imago goes. It is a smaller insect than *ignobilella*, with the head black in both sexes, and a violet rather than purple hind margin to the fore-wings: on the other hand, the larva is bright green, not yellow as there described, and instead of feeding in September and October as stated in the "Entomologist's Companion", is fed up and over by the end of August.

"The general cut of its mine varies according to where the egg is laid, and to some extent according to the size and fleshiness of the leaf. The favourite spot for the egg is underneath the leafy frill edging the stalk. The mine travels at first for a short distance down the stalk, I mean in the direction of the trunk: it then turns round and proceeds in the opposite direction till it reaches the blade; here it keeps accurately to the edge for some little way, and then makes one short turn back on itself and ends, or, if the leaf be especially large and fleshy, the last turn is omitted. This form would be quite *sui generis*, were it not occasionally mimicked to a turn by *pygmaeella*: still, as the one larva is green and the other yellow, there is no risk of confusing the full mines, whilst the empty ones, as I have already pointed out, may be told from the position of the eggs [on the underside with *gratiosella* and the upperside with *pygmaeella*]. Sometimes, instead of a single turn back upon itself, two or three are made, if the leaf be small and thin, yet for all that the mine is so small that it manages to keep within the limits of the lobe. The other position for the egg is under one of the ribs. In this case the small twisting gallery keeps within the narrow compass in the middle of the leaf or in one of the lobes. To compare it now with *oxyacanthella*.

"The eggs of both are laid on the underside, but whilst *gratiosella* prefers the stalk to a rib, *oxyacanthella* has a greater liking for the ribs. The mines are very similar. But *gratiosella's* is smaller and its course more timid, the gyrations being short and keeping close together; whereas in *oxycanthella* the curves are sweeping and pass across or round the lobes from one side of the leaf to the other, and even when the egg is laid upon the stalk and the mine comes out along the edge as in *gratiosella*, it turns off sooner or later into the body of the leaf and pursues its usual bold and wandering course. The best distinction, however, lies in the larvae. The head of *gratiosella* is of palest brown, so that little more than the mouth-parts are visible in the mine; that of *oxyacanthella* is

grey or black, and is always distinct, and sometimes very distinct; *oxyacanthella* also shows, but obscurely, the cephalic ganglia, of which there is no trace in the other. I think, too, that the ground-colour is more bluish in *gratiosella* than in *oxyacanthella*, but never having had the two side by side, I speak doubtfully. In these parts, and I am fairly well south [Herefordshire], both species are single-brooded. I never find the larva of *oxyacanthella* in July and August, nor that of *gratiosella* in September and October, and I have given the hawthorn hedges a good deal of attention.".

I cannot proceed until I have paid a tribute to the beauty and clarity of Wood's prose and the accuracy of his observation. Unfortunately, he made a not unnatural but serious mistake when he jumped to the conclusion that his "green *oxyacanthella*-like larvae were those of "*gratiosella*". He had, in fact, discovered a new species, but tried to fit it into the then known range of hawthorn-feeding neps. We must remember that he was writing before the development of the technique of dissecting genitalia, and he was dealing with moths which superficially are almost indistinguishable. Wood's description is, as far as I know, the first and most detailed to be made of this species. It had to wait till 1936 before it received a name at the hands of Dr Klimesch, who had found it in central Europe. He called it *crataegella*.

Meanwhile our text-books had accepted Wood's interpretation, and were ascribing the life-history of *crataegella* to "*gratiosella*". The study of the Nepticulidae was in the doldrums in this country, and no-one seems to have paid much attention to Klimesch's new species. After a lapse of a quarter of a century A. G. Carolsfeld-Krausé, a Danish entomologist (1961), pointed out to us in the "Entomologist's Record" that we should add *crataegella* to the British List on the evidence of Wood's article, but still we took no notice. Perhaps Carolsfeld-Krausé himself was partly to blame, because, instead of announcing this new addition to our fauna with a fanfare of trumpets, he tacked the news on, almost in parenthesis, to a dry discussion of the authorship of the name "gratiosella". So unobtrusive was the pronouncement that Heslop (1964) failed to pick this species up either for his original list or in any of his supplements, in spite of the fact that Carolsfeld-Krausé was his mentor for the Nepticulidae.

Two years later it was rediscovered, quite independently, it seems, by Mr S. C. S. Brown, who found the mines in Bournemouth and had them identified by Carolsfeld-Krausé. On the strength of these mines (but not Carolsfeld-Krausé's paper of 1961), Ellerton (1970) included *crataegella* in his list of species recently discovered in Britain. For confirmation, Mr Brown sent a further batch of mines to Dr Klimesch last autumn and he proffered the same determination as that given by Carolsfeld-Krausé.

Mr Brown told me of his discovery and was kind enough to send me some pressed leaves containing mines. I at once

recognized them as closely resembling mines which I had been determining as a first generation of *oxyacanthella*. About this time, I read Wood's article (1894) and spotted that his "gratiosella" was in fact *crataegella*. Preening myself in my discovery, I submitted my theories to Dr Klimesch, whom we revere as the doyen of authorities on the Nepticulidae, and he duly confirmed them, drawing my attention to the article by Carolsfeld Krausé of which I was previously unaware. (A Dane records a new British species of the Nepticulidae, in our literature, and an Austrian brings it to my attention. A hundred years ago, in Stainton's day we were a great power in the study of this family; how are the mighty fallen!)

I read Carolsfeld-Krausé's paper with mixed feelings. I felt rather as Scott must have done when he reached the South Pole only to find that Amunsden had got there first. On the other hand, I was gratified to have my views corroborated by such powerful authorities. I have more to say about *crataegella*, but it must wait for the moment, as my task of dealing with the mistakes and uncertainties surrounding our hawthorn-feeding neps is far from done.

The theme of what follows next falls into the category of uncertainty rather than error, for though mistakes have undoubtedly been made, I cannot as yet identify them. I am referring to the problem of distinguishing *ignobilella* from *hybnerella* (*gratiosella*). Wood, as we have seen, found them so much alike that he brought in a third species: he added two and one and made the answer two. By making *crataegella* stand for *"gratiosella"*, he "lumped" the true *gratiosella* and *ignobilella* together, and we must now try to prize them apart. As I shall make rather heavy weather of this, I apologize in advance to the reader.

The descriptions of the life-history of *hybnerella* (*gratiosella*) in Tutt (1899), Meyrick (1928) and Ford (1949) are wrong, since they are based on Wood and refer to *crataegella* (Tutt also quotes an accurate description by Frey but makes no attempt to reconcile it with the longer description by Wood which dominates the passage). We must therefore turn to continental writers. Let us consider in turn the mines, the larvae and the imagines of the two species.

The mines of both start as a slender gallery with a central excremental line, leaving clear margins. This abruptly leads into a wide, irregular blotch. According to Hering (1957) the frass line in the early gallery is wider and fills more than half the gallery in the case of *ignobilella*, whereas it is narrower, filling less than half the gallery, in *hybnerella*. *Borkowski* (1969), however, states that the width of the frass depends on whether the mined leaf is in sunshine or shade, and he regards the colour of the larva as the only certain means of distinction. I have studied the large number of mines attributed to each species in the Hering herbarium, and I have failed to find any reliable character by which they may be separated. (To be continued.)